

Speed, time & distance

$$S = \frac{D}{T}$$

$$D = ST$$

$$T = \frac{D}{S}$$

Case 1 speed constant

$$\frac{D}{T} = \text{Constant}$$

$$\frac{D_1}{T_1} = \frac{D_2}{T_2}$$

$$\frac{D_1}{D_2} = \frac{T_1}{T_2}$$

Ratio of distance = ratio of time

Case 2 Distance is constant

$$ST = \text{Constant}$$

$$S_1 T_1 = S_2 T_2$$

$$\frac{S_1}{S_2} = \frac{T_2}{T_1}$$

Ratio of speed =  $\frac{1}{\text{ratio of time}}$

Case 3 Time is constant

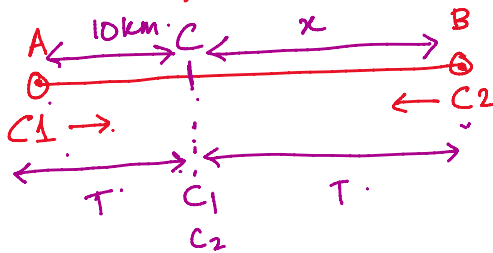
$$\frac{D}{S} = \text{Constant}$$

$$\frac{D_1}{S_1} = \frac{D_2}{S_2}$$

$$\frac{D_1}{D_2} = \frac{S_1}{S_2}$$

Ratio of distance = ratio of speed

Car 1 starts from a point A and goes to a point B. Car 2 starts at the same time from point B and goes towards point A. If the ratio of the speeds of Car 1 and Car 2 is 2:3 and if they meet at a point which is 10 km from A find the distance between A and B.



Time is constant.

$$\frac{10}{x} = \frac{2}{3}$$

$$x = 15$$

25 km

In a 100m race A beats B by 10m and B beats C by 10m. If A finishes the race in 10 sec what will be the time taken by C to complete the race.

$$\frac{S_A}{S_C} = \frac{S_A}{S_B} \cdot \frac{S_B}{S_C}$$

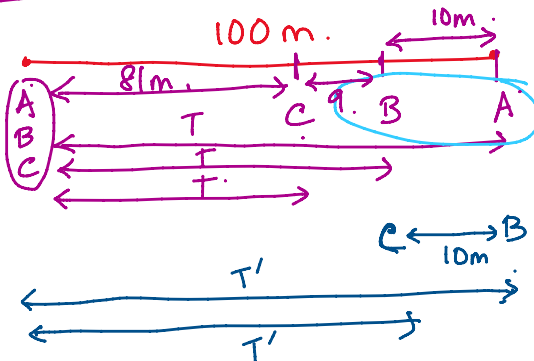
$$= \frac{10}{9} \times \frac{10}{9}$$

$$= \frac{100}{81} = \frac{D_A}{D_C}$$

$$S_A = \frac{100}{10} = 10 \text{ m/s}$$

$$S_C = 8.1 \text{ m/s}$$

$$\frac{10}{S_C} = \frac{100}{81}$$



$$\frac{D_A}{D_B} = \frac{S_A}{S_B}$$

$$\frac{100}{90} = \frac{S_A}{S_B} \quad \text{--- (1)}$$

$$\frac{100}{90} = \frac{S_B}{S_C} \quad \text{--- (2)}$$

$$S_A = \frac{100}{10} = 10 \text{ m/s} \quad S_C = 8.1 \text{ m/s.} \quad S_C \quad 81$$

$$\frac{D}{T_C} = 8.1 \quad \frac{100}{T_C} = 8.1 \quad T_C = \frac{100}{8.1} = 12.34 \text{ sec.}$$

A and B starts from opposite end of a track. at the same time and runs towards each other. They take 16 and 25 sec to reach their destinations after crossing each other. If the speed of A is 40 km/hr find the speed of B.

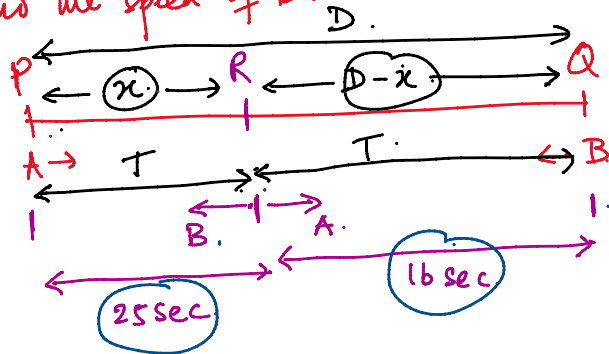
$$S_A = 40$$

$$\frac{S_A}{S_B} = \frac{25S_B}{16S_A}$$

$$\frac{S_A^2}{S_B^2} = \frac{25}{16} = \frac{5^2}{4^2}$$

$$\frac{S_A}{S_B} = \frac{5}{4}$$

$$S_B = 32$$



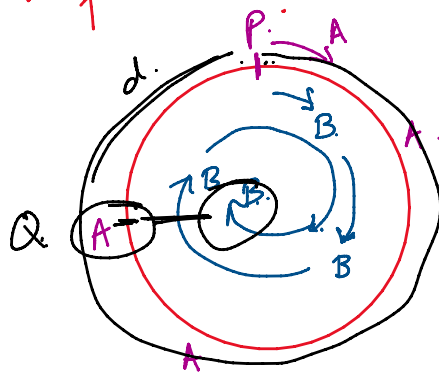
$$\frac{S_A}{S_B} = \frac{x}{D-x}$$

$$S_A = \frac{D-x}{16} \rightarrow \frac{D-x}{16} = 16S_A$$

$$S_B = \frac{x}{25}$$

$$x = 25S_B$$

A and B start from a point P on a circular track and run in the same direction. If the ratio of their speeds is 2:3 and the track is 400 m in circumference. at what distance from P will they meet for the first time?



$$S_A = 2x \quad S_B = 3x$$

$$D_A = 400 - d$$

$$D_B = 400 + (400 - d) = 800 - d$$

$$T_A = \frac{D_A}{S_A} = T_B = \frac{D_B}{S_B}$$

$$\frac{400-d}{2x} = \frac{800-d}{3x}$$

$$1200 - 3d = 1600 - 2d$$

$$d = -400$$

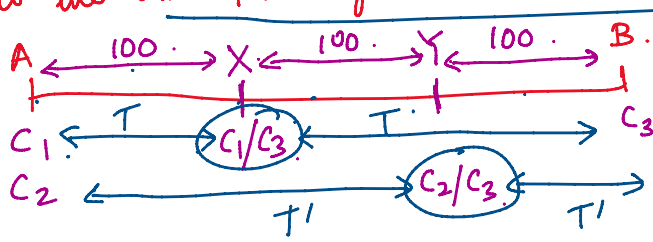
Car 1 and car 2 start from a point A and move towards B.

Car 3 start from B at the same time and move towards A.

Car 1 meets car 3 at a distance of 100 m from A and car 2

distance between

Car 1 meets car 3 at a distance of 100 m from A and car 2 meets car 3 at a distance of 200 m from A. If the distance between A and B is 300 m and the time taken by car 1 to reach B is 15 hrs find the time taken by car 2 to reach B.



$$\frac{1}{2} = \frac{C_1}{C_3}$$

$$\frac{2}{1} = \frac{C_2}{C_3}$$

$$\frac{\frac{D}{T_1}}{\frac{D}{T_2}} = \frac{1}{4}$$

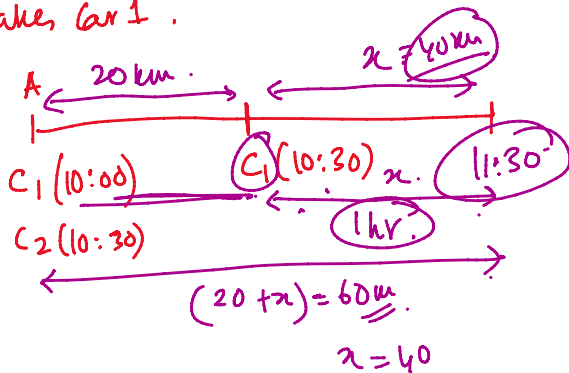
$$\frac{C_1}{C_2} = \frac{1}{4}$$

$$\frac{T_2}{T_1} = \frac{1}{4}$$

$$T_1 = 15 \text{ hrs}$$

$$T_2 = 3.75 \text{ hrs}$$

Car 1 starts from A at 10 am. Car 2 also start from A at 10:30 am and follows Car 1. If the ratio of the speeds of Car 1 and Car 2 is 2:3 and the speed of Car 1 is 40 km/hr find the time when Car 2 overtakes Car 1.



$$S_1 = 40$$

$$S_2 = \frac{3}{2} \times 40 = 60$$

$$\frac{x}{C_1} = \frac{20+x}{C_2}$$

$$\frac{x}{2} = \frac{20+x}{3}$$

$$3x = 40 + 2x$$